Advances of corneal surgery in small animals

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Introduction

The cornea is a unique portion of the outer fibrous tunic of the eye. Its transparency has a major refractive function while maintaining a barrier between the eye and the environment. Corneal disease, which are common both in dogs and cats, may result in corneal insults as: opacification, vascularization, ulceration, pigmentation, oedema or perforation. Surgical intervention is often required in order to re-establish its normal role, improving the patient's vision and quality of life. Keratectomy, conjunctival graft and corneoscleral transposition have been until now, the main surgical techniques performed in veterinary ophthalmology for treating these conditions. The aim of this review is to present other therapeutic options rising in importance, both in our field and in human ophthalmology.

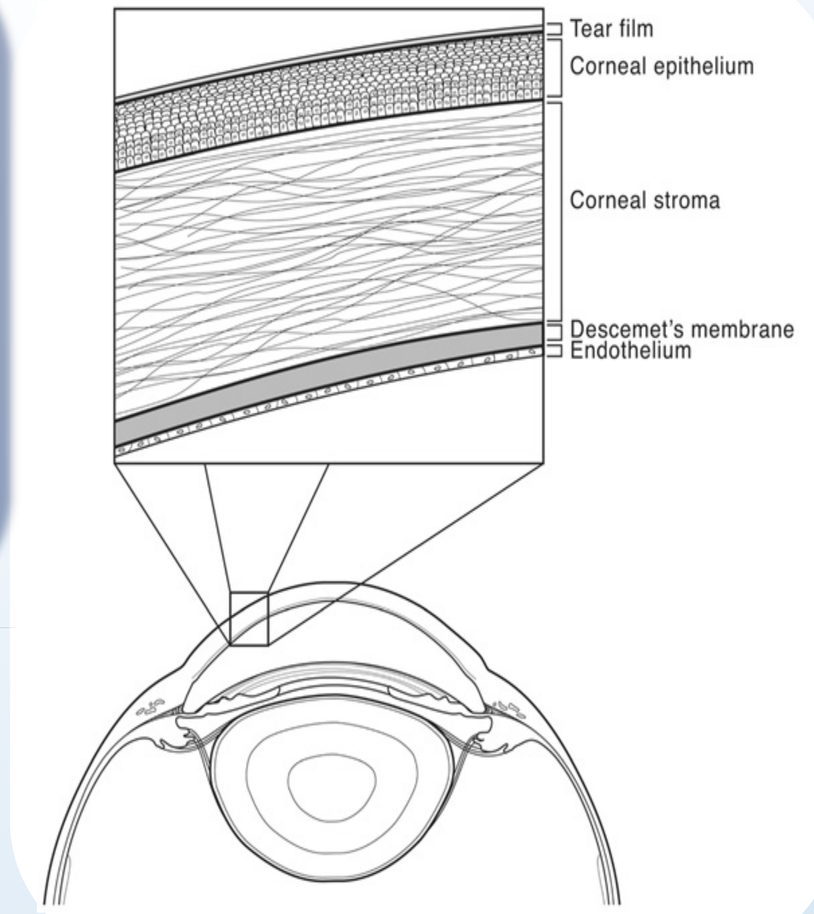


Figure 1. Corneal layers in small animals. [1]

Conventional corneal surgical techniques

Superficial keratectomy[2]

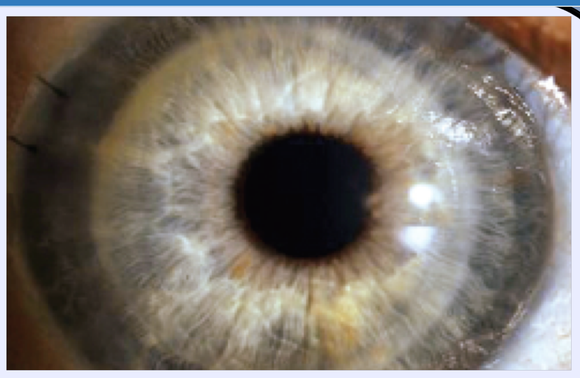
Conjunctival graft[2]

Corneoscleral transposition[3]

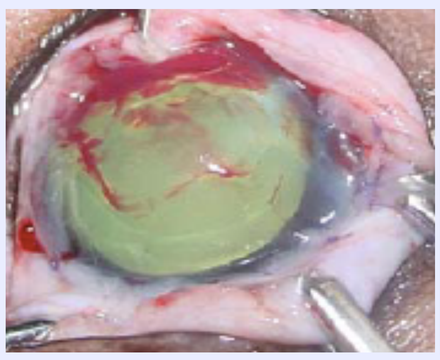
Advanced corneal surgical techniques

PK[4]*: Postop and 16 Months after surgery*

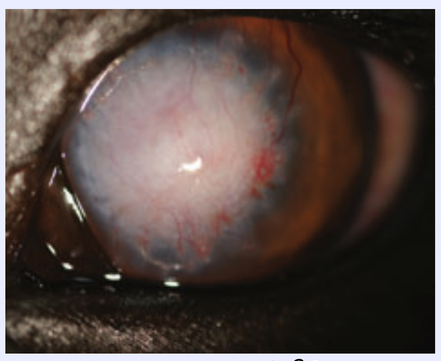
ALK[5]*: Postop and 4 Months after surgery*



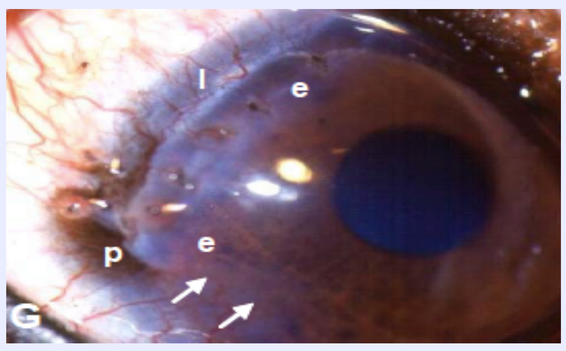
EK in a human patient[6]



Amniotic membrane[7]*: Intraop and 2 Months after surgery*



Biomaterials[8]*: 1 Month and 2 Months after surgery*



Limbal Stem Cells Transplantation[9]

Conclusions

		Keratectomy	CG[10]	CCT[11]	Keratoplasty				
					PK[12]	ALK[13]	EK[14]	AM[15]	BM[16]
Indications	Epithelial damage	✔	✔	✔	✔	✔	✗	✔	✔
	Ulcerative keratitis	✗	✔	✔	✔	✔	✗	✔	✔
	Corneal sequestrum	+/-	✔	✔	+/-	✔	✗	✔	✔
	Descemetocele	✗	✔	✔	✗	✔	✗	✔	✔
	Perforation	✗	✔	✗	✗	✔	✗	+/-	+/-
	Endothelial diseases	✗	✗	✗	✔	✗	✔	✗	✗
Transparency		↓↓	↓	↓	↑	↑↑	↑	↑↑	↑
Rejection		-	-	-	↑	↓	↑	↓	↓
Availability		↑	↑	↑	↓↓	↓	↓↓	↓	↓

Figure 2. Comparative table between different techniques. (10) Conjunctival graft; (11) Corneoconjunctival transposition; (12) Penetrating keratoplasty; (13) Anterior lamellar keratoplasty; (14) Endothelial keratoplasty; (15) Amniotic membrane transplantation; (16) Biomaterials transplantation.

(✔) Yes; (✗) No; (+/-) Controversial; (↑) Good outcome; (↓) Bad outcome; (-) Irrelevant.

- Corneal grafting is becoming the main technique due to providing more positive results of visual outcome.
- Development of new materials and conservation methods allow to increase this procedure's availability.
- Deeper research is needed into corneal immune response and immunosuppressive treatment as well as the use of laser, cross-linking, keratoprosthesis and stem cells transplantation techniques.

References

1. Ledbetter EC, Gilger BC. Chapter 11: Canine Cornea: Diseases and Surgery. In: Gelatt KN. Essentials of Veterinary Ophthalmology. 3rd rev. John Wiley&Sons; 2014; p.217
2. Gelatt KN, Brooks DE. Chapter 8: Surgery of the ornea and sclera. In: Gelatt KN, Gelatt JP. Veterinary Ophtalmic Surgery. Missouri: Saunders Elsevier; 2011
3. Andrew SE, Tou S, Brooks DE. Corneoconjunctival transposition for the treatment of feline corneal sequestra: a retrospective study of 17 cases. Vet Ophthalmol 2001;4(2):107-111
4. Townsend WM, Rankin AJ, Stiles J, Krohne SG. Heterologous penetrating keratoplasty for treatment of a corneal sequestrum in a cat. Vet Ophthalmol 2008;11(4):237-278
5. Laguna F, Leiva M, Costa D, Lacerda R, Peña T. Corneal grafting for the treatment of feline corneal sequestrum: a retrospective study of 18 eyes (13 cats). Vet Ophthalmol 2015;18(4):291-296
6. Tan DTH, Dart JKG, Holland EJ, Kinoshita S. Corneal transplantation. Lancet 2012 May;379:1729-1761
7. Kalpravidh M, Tuntivanich P, Vongsakul S, Sirivaidyapong S. Canine amniotic membrane transplantation for corneal reconstruction after the excision of dermoids in dogs. Vet Res Commun 2009;33:1003–1012
8. Dulaurent T, Azoulay T, Goulle F, Dulaurent A, Mentek M, Peiffer RL, Isard PF. Use of bovine pericardium (Tutopatch®) graft for surgical repair of deep melting corneal ulcers in dogs and corneal sequestra in cats. Vet Ophthalmol 2014;17(2):91–99
9. Brunelli ATJ, Vicente FAM, Chahud F, Oria AP, Bolzan AA, Campos CF, Doria FA, Laus JL. Sclerocorneal limbal stem cell autograft transplantation in dogs. Arq. Bras. Med. Vet Zootec 2009;59(5):1194-1204